

MEMORANDUM FOR ARMY BOARD MEMBER, COLONEL PATRICK DUNKLE
NAVY BOARD MEMBER, CAPTAIN MIKE HERB
AIR FORCE BOARD MEMBER, MR. PAUL PRICE
MARINE CORPS BOARD MEMBER, MR. JERRY MAZZA

SUBJECT: 321st Board Meeting

The Department of Defense Explosives Safety Board (DDESB) held its 321st meeting on 05 December 2001 and took the following actions:

a. The Board approved the Secretariat proposal to modify the earth-covered magazine (ECM) listing in Chapter 5 of Department of Defense (DoD) 6055.9-STD as given in attachment (1). The changes to DoD 6055.9-STD are contained in:

- Paragraphs C5.2.1.2., C5.2.1.2.1. - C5.2.1.2.4., C5.2.2.2., C5.2.6.4., and C5.3.2.4.
- Paragraphs C5.2.1.2.5., C5.2.1.3. - C5.2.1.5., and C5.2.1.5.1. - C5.2.1.5.2. that are deleted
- Paragraphs C9.3.1.1., C9.3.1.4.1., C9.1.4.2.4., and C9.3.1.4.4.
- C10.5.2.5.2.
- Definitions AP1.1.1.1. (Aboveground Magazine) and AP1.1.1.58 (ECM)
- Definition AP1.1.1.87 (Standard Igloo Magazine) that is deleted
- New references for DDESB Technical Paper 15 “Approved Protective Construction” and HNDED-CS-95-01 “Guide for Evaluating Blast Resistance of Non-Standard Magazines”

b. The Board approved the Secretariat proposal to revise current Hazard Division (HD) mixing rules contained in Chapter 9, DoD 6055.9-STD as given in attachment (2). The changes to DoD 6055.9-STD are contained in:

- Paragraph C9.2.1.”Quantity of Explosives” and sub-paragraphs C9.2.1.1. - C9.2.1.9.
- New acronym - Joint Hazard Classification System (JHCS)

c. The Board approved the Secretariat proposal to clarify the DoD criteria for application of barricaded intermagazine distance (IMD) and intraline distance (ILD) separation in DoD 6055.9-STD as given in attachment (3). The changes to DoD 6055.9-STD are contained in:

- Paragraphs C9.3.1.2. - C9.3.1.3.6.
- Figure C9.F1.(g) “Possible Intraline and Intermagazine Relationships with an ECM”
- Table C9.T4. “HD 1.1 ILD from ECM”

d. The Board approved the Secretariat proposal to clarify General Comment “e” in Table C9.T2. in DoD 6055.9-STD as given in attachment (4).

e. The Board tabled the Secretariat proposal to clarify the siting criteria for small quantities of HD 1.1 (≤ 450 lbs), the use of ECM inhabited building distance columns for other than 7-bar and 3-bar ECM, and the application of HD 1.1 criteria to HD 1.2.1 items under certain situations involving small quantities (≤ 450 lbs) in DoD 6055.9-STD. The Secretariat was directed to send the proposed change out to the Board for review and comment, with a response back to the Chair by 5 February 2002. The Secretariat is to present a coordinated proposal at the next Board meeting.

f. The Board approved the correction of errors in Table 10-3 of DoD 6055.9-STD as given in attachment (5).

g. The Board approved the correction of the IMD error in Table C9.T5 of DoD 6055.9-STD as given in attachment (6).

h. The Board tabled the Army proposed change to make Compatibility Group (CG) C items compatible (in storage) with CG-G items in “Storage Compatibility Mixing Chart” Table C3.T1, DoD 6055.9-STD and with new Footnote 11. The Board directed the Army to revise the proposal based on the comments during the Board meeting and to re-submit at a later Board meeting.

i. The Board approved the Navy proposed change to criteria for separation of non-explosives ships from explosives ships at anchorages in DoD 6055.9-STD as indicated in attachment (7). The changes are given in:

- New paragraph C9.5.4.6.
- Figure C9.F2. “Application of Separation Distances for Ship and Barge Units”

j. The Board approved the Secretariat proposals for revising the approved munitions for ARMCO Revetments in paragraph C5.3.6.2. of DoD 6055.9-STD as given in attachment (8). As a result of the approved change, the DDESB memorandum maintained by the Secretariat listing approved munitions qualified for storage in ARMCO revetments is rescinded.

k. The Board did not approve the Secretariat proposed definition for “intentional detonation” and the clarification of the applicability of the criteria. The Secretariat was directed to modify the proposal based on Service comments provided during the Board meeting and present the revised proposal to the Board at the next meeting.

l. The Board directed the Secretariat to work with the Services in finalizing the two new definitions “Secure Explosives Holding Area” and Secure Non-Explosives Holding Area” and the criteria associated with them. Once this work has been completed, the Board Chairman will conduct a telephone conference with Board members to approve the proposed change.

m. The Board approved the minor change to Table C5.T2 “Maximum Case Fragment Ranges for Selected Single Item Detonations,” DoD 6055.9-STD as given in attachment (9).

n. The Board approved and signed a memorandum amending the initial guidance for risk-based explosives safety siting using Safety Assessment of Explosives Risk (SAFER). The Board approved the use of SAFER 2.0 for risk-based siting.

o. The Board directed the Secretariat to send out the coordinated revised DoD Directive 6055.9 to the Board for staffing within their Services with comments back to the Chair by 01 February 2002 so that final OSD coordination can be initiated.

p. The Board directed the Secretariat to send out Chapter 7 (Lightning Protection), DoD 6055.9-STD to the Board for staffing with comments back to the Chair by 01 February 2002 in preparation for proposing a revision to Chapter 7 at the next Board meeting.

The Board scheduled the next formal meeting for 20 February 2002.

/s/William E. Wright
 WILLIAM E. WRIGHT
 Captain, USN
 Chairman

/s/ Patrick Dunkle
 PATRICK DUNKLE
 Colonel, USA
 Army Member

/s/Mike Herb
 MIKE HERB
 Captain, USN
 Navy Member

/s/Paul price
 PAUL PRICE
 Air Force Member

/s/Jerry Mazza
 JERRY MAZZA
 Marine Corps Member

Attachments
 As stated

cc:

Alternate Army Board Member, Mr. Gary Abrisz
 Alternate Navy Board Member, Mr. Richard Eldridge
 Alternate Air Force Board Member, Col Randall Strauss
 Alternate Marine Corp Board Member, Col Henry Dewey, III
 JCS(J-4-SMPED)
 DTRA (Gatski)
 DCMA (DCMA-O)
 TRANSCOM (TCJ4-LT)
 DA, Director of Safety (Mr. J. Gibson)
 USADAC/SMAAC-ES (Mr. Johnnie Cook)
 NOSSA/N711 (Mr. Richard T. Adams)

TITLE: Modification of ECM listing in Chapter 5 of DoD 6055.9-STD.

APPROVED CHANGES:

CHANGE 1:

C5.2.1.2. ECM may be approved for storage of up to 500,000 pounds NEW of Hazard Division 1.1 in accordance with C9.T5. DDESB Technical Paper No. 15, Approved Protective Construction (reference (ap)), provides listings of the various types of ECM that have been constructed over the years. These magazines are identified by their structural strength designator (i.e. "7-Bar", "3-Bar", or "Undefined"). Table 4-1 of Reference (ap) lists the "7-Bar" and "3-Bar" ECM designs that are currently approved for new construction.

C5.2.1.2.1. If an ECM's drawing number(s) is not listed in reference (ap), it will be treated as an "Undefined" ECM, until a structural analysis is performed to show that the ECM qualifies for another strength designation, or support documentation is provided to show the ECM had been approved previously by the DDESB with a different strength designation.

C5.2.1.2.2. For existing, arch-shaped "Undefined" ECM, the Guide for Evaluating Blast Resistance of Non-Standard Magazines (reference (aq)) may be used to determine if an "Undefined" ECM could qualify as a "7-Bar" or a "3-Bar" ECM.

C5.2.1.2.3. DDESB approval is required prior to any change in an ECM's structural strength designator.

C5.2.1.2.4. Certain ECM, aboveground magazines, and containers have been approved with reduced NEW and/or reduced Q-D and these are also listed in Table 4-4 of reference (ap). Use of these structures/containers requires that their use and siting meet all conditions/restrictions specified in the design and approval documentation, as described in reference (ap).

C5.2.1.2.5. Delete

C5.2.1.3. Delete

C5.2.1.4. Delete

C5.2.1.5. Delete

C5.2.1.5.1. Delete

C5.2.1.5.2. Delete

CHANGE 2:

C5.2.6.4. New construction of previously DDESB approved "7-Bar" and "3-Bar" ECM must meet the minimum requirements of the current revisions of the approved drawings.

CHANGE 3:

C5.2.2.2. Last sentence; change "... priority shall be given to covered storage (igloo)..." to "... priority shall be given to the use of ECM..."

C5.3.2.4. Change "... between igloo magazines..." to "... between ECM..."

C9.3.1.1. In two places (1st and 2nd sentences); Change "... from standard earth-covered magazines..." to "from ECM..."

C9.3.1.4.1. 1st sentence; Delete the word "standard".

C9.3.1.4.1. Last sentence; Change "... igloo..." to "...ECM..."

C9.3.1.4.2.4. Change "... standard igloo..." to "...ECM..."

C9.3.1.4.4. Change "... igloo magazine..." to "...ECM..."

C10.5.2.5.2. Change "... when using standard (3-bar or 7-bar) earth-covered magazines." to "... when using 7-Bar or 3-Bar ECM."

CHANGE 4:

AP1.1.1.1. Aboveground Magazine. Any open area or any structure not meeting the requirements of an ECM that is used for explosives storage.

AP1.1.1.58. Earth-Covered Magazine (ECM). Any earth-covered structure that meets soil cover depth and slope requirements of C5.3. ECM have three possible structural strength designations ("7-Bar", 3-Bar", or "Undefined"). The strength of an ECM's headwall and door(s) determines its designation

AP1.1.1.87. DELETE

CHANGE 5 (new references):

- (ap) Department of Defense Explosives Safety Board (DDESB) Technical Paper No. 15, "Approved Protective Construction", 2 February 2001.
- (aq) HNDED-CS-S-95-01, "Guide for Evaluating Blast Resistance of Non-Standard Magazines", U.S. Army Corps of Engineers, Engineering Support Center, Huntsville, AL. January 1995.

TITLE: Revision of current HD mixing rules.

APPROVED CHANGES:

C9.2.1. **Quantity of Explosives.** The total quantity of explosives in a facility is calculated as shown below. Where the DDESB has approved an HE equivalence for a propellant and/or pyrotechnic, then this HE equivalence may be used for determining NEW. In such cases, the sum of the HE plus the HE equivalence of the propellant and/or pyrotechnic will be the applicable NEW. The JHCS provides explosive weights for all DoD Hazard Classified ammunition and explosives.

C9.2.1.1. **Mass-explosion (HD 1.1).** The NEW is the total weight of all HE plus the total weight of all propellant in the HD 1.1 items.

C9.2.1.2. **Non-mass explosion, fragment producing (HD 1.2).**

C9.2.1.2.1. HD 1.2.1. The NEW is the total weight of all HE plus the total weight of propellant in all HD 1.2.1 items. In certain situations, the maximum credible event (MCE), as outlined in C9.3.2.4, will be used as the basis for determining applicable Q-D.

C9.2.1.2.2. HD 1.2.2. The NEW is the total weight of all HE plus the total weight of propellant in all HD 1.2.2 items.

C9.2.1.2.3. HD 1.2.3 (Unit Risk HD 1.2). The NEW is the total weight of all HE plus the total weight of propellant in all HD 1.2.3 items. This material is treated as HD 1.3, however, a minimum IBD will apply, as outlined in C9.3.2.12.

C9.2.1.3. **Mass fire, minor blast, or fragment (HD 1.3).** The NEW is the total weight of all HE, propellant, and pyrotechnics in all HD 1.3 items.

C9.2.1.4. **Moderate fire, no blast, or fragment (HD 1.4).** The NEW is the total weight of all HE, propellant, and pyrotechnics in all HD 1.4 items.

C9.2.1.5. **Explosive substance, very insensitive (with mass explosion hazard) (HD 1.5).** The NEW is the total weight of all HE plus the total weight of propellant in all HD 1.5 items.

C9.2.1.6. **Explosive article, extremely insensitive (HD 1.6).** The NEW is the total weight of EIDS in all HD 1.6 items. However, the weight of EIDS in a single HD 1.6 will also be considered, as specified in C9.T12, for determining Q-D.

C9.2.1.7. **Exclusions.** Munitions' fillers that do not contribute to explosive effects (e.g. colored and HC smoke, dyes, irritants, white phosphorus (WP), plasticized white phosphorus (PWP), and pyrophoric agent TPA) are excluded when determining NEW.

C9.2.1.8. If DDESB-approved buffer configurations are provided, the NEW is the explosives weight of the largest stack plus, if applicable, the explosives weight of the buffer material, excluding the NEW of HD 1.4.

C9.2.1.9. **Determining the Explosive Weight for Mixed HDs.**

C9.2.1.9.1. **General.**

C9.2.1.9.1.1. The presence of HD 1.4 does not affect the NEW of mixed HD.

C9.2.1.9.1.2. When HD 1.1 is mixed with any other HD, treat the mixture as HD 1.1, except as noted in C9.2.1.9.2.

C9.2.1.9.1.2. HD 1.5 is always treated as HD 1.1.

C9.2.1.9.2. **HD 1.1 with HD 1.2 (HD 1.2.1, HD 1.2.2, and HD 1.2.3).**

Use whichever of the following generates the largest QD: a) sum the NEW for HD 1.1 and NEW for HD 1.2 and treat the mixture as HD 1.1, or b) the NEW of the mixture is the NEW of the HD1.2 subdivision requiring the largest QD.

C9.2.1.9.3. **HD 1.1 with HD 1.3.** Sum the NEW for HD 1.1 and the NEW for HD 1.3 and treat the mixture as HD 1.1.

C9.2.1.9.4. **HD 1.1 with HD 1.6.** Sum the NEW for HD 1.1 and the NEW for HD 1.6 and treat the mixture as HD 1.1.

C9.2.1.9.5. **HD 1.2.1 with HD 1.2.2.** The NEW for the mixture is the NEW of the sub-division requiring the largest Q-D.

C9.2.1.9.6. **HD 1.2.1 with HD 1.2.3.** The NEW for the mixture is the NEW of the sub-division requiring the largest Q-D.

C9.2.1.9.7. **HD 1.2.2 with HD 1.2.3.** The NEW for the mixture is the NEW of the sub-division requiring the largest Q-D.

C9.2.1.9.8. **HD 1.2.1 with HD 1.2.2 with HD 1.2.3.** The NEW for the mixture is the NEW of the sub-division requiring the largest Q-D.

C9.2.1.9.9. **HD 1.2 (HD 1.2.1, HD 1.2.2, and HD 1.2.3) with HD 1.3.** The NEW for the mixture is the NEW of the HD requiring the largest Q-D.

C9.2.1.9.10. **HD 1.2 (HD 1.2.1, HD 1.2.2, and HD 1.2.3) with HD 1.6.** Treat the HD 1.6 as HD 1.2.3 and determine NEW in accordance with C9.2.1.9.6 through C9.2.1.9.8 above, as applicable.

C9.2.1.9.11. **HD 1.3 with HD 1.6.** Sum the NEW for the HD 1.6 and the NEW for HD 1.3 and treat the mixture as HD 1.3.

Change 2: (Addition to "Abbreviations and Acronyms"):

JHCS - Joint Hazard Classification System

TITLE: Clarification of DoD Criteria for Application of Barricaded IMD and ILD Separation Distances

APPROVED CHANGES:

CHANGE 1 (Revision of C9.3.1.2 through C9.3.1.6):

C9.3.1.2. **Intraline Distance.** Separation distances required between explosives and nonexplosives buildings and sites within an explosives operating line are listed for various quantities of Hazard Division 1.1 in Table C9.T3. Provisions of subsection C9.2.2 above, shall be used in applying this table except that the distance required between an explosives operating building and its service magazines is determined by the quantity of explosives in the service magazines irrespective of the quantity in the operating building. Permissible exposures at intraline distances are listed in subsections C2.4.1 (barricaded intraline distance) and C2.4.2 (unbarricaded intraline distance) of Chapter 2. In order to apply barricaded intraline distance, barricades must comply with C5.3.

C9.3.1.2.1. **Intraline Distance from ECM.** Testing has shown some attenuation of airblast overpressure occurs out the sides and rear of an ECM and a slight increase out the front of an ECM, relative to an unconfined surface burst. The equivalent $9W^{1/3}$ (12 psi) barricaded intraline distance and $18 W^{1/3}$ (3.5 psi) unbarricaded intraline distance from ECM, accounting for this attenuation, are given in C9.T4.

DELETE THE FOLLOWING CHART (The information in the chart below will be represented by formulas that are being added to C9.T4):

Exposure	NEW Range (lbs)	Vice K9	Vice K18
Front	1-300K ¹	10	18
	300 - 500K	10 - 9	18
Side	1 - 300K	7	16
	300 - 400K	7 - 9	16 - 18
	over 400K	9	18
Rear	1 - 100K	6	12
	100 - 300K	6	12 - 14
	300 - 400K	6 - 9	14 - 18
	over 400K	9	18
¹ 300K = 300,000			

C9.3.1.2.2. **Barricaded Intraline Distance from ECM.** Paragraph C9.3.1.3.5 provides criteria for the application of barricaded intraline distance from ECM.

C9.3.1.2.3. **Intraline Distance from HP Magazines.** Test results show that the earth-bermed HPM attenuates pressures relative to the unconfined surface burst configuration. The attenuation is similar to that shown for an ECM in C9.3.1.2.1. The values shown in Table C9.T4 for the front exposure also apply to the front of the HPM. The values

shown in Table C9.T4 for the side exposure also apply to the side and rear exposures of the HPM. The definition of “front” for ECM (see C9.3.1.3.1) also applies to the HPM.

C9.3.1.3. **Intermagazine Distances.** Magazines for Hazard Division 1.1 shall be separated one from another in accordance with Table C9.T5. Magazine orientation aspects of Table C9.T5, Part A, involve the following considerations:

C9.3.1.3.1. When ECM containing Hazard Division 1.1 ammunition are sited so that any one is in the forward sector of another, the two must be separated by distances greater than the minimum permitted for side-to-side orientations. The forward sector, or "front", of an ECM is that area 60 degrees either side of the magazine centerline (120 ° combined angle) with the vertex of the angle placed so that the sides of the angle pass through the intersection of the headwall and sidewalls. The greater distances are required primarily for the protection of door and headwall structures against blast from a PES forward of the exposed magazine, and to a lesser extent due to the directionality of effects from the source. The rear sector, or "rear", of an ECM is that area 45 degrees either side of the magazine centerline (90 ° combined angle) with the vertex of the angle placed so that the sides of the angle pass through the intersection of the rear and side walls. Figure C9.F1.(g) illustrates the front (120 °), side, and rear (90°) sectors of an ECM. When a blast wave is reflected from a surface at other than grazing incidence (side-on orientation), the overpressure may be increased substantially over the free-field value. High reflected pressure and impulse can damage doors and headwalls and propel the debris into the ECM so that explosion is communicated by impact of such debris upon the contents.

C9.3.1.3.2. Examples of siting rules relative to magazine orientations (illustrated in Figure C9.F1.) follow:

C9.3.1.3.2.1. See Figure C9.F1. (a) and (b). Site A as a side-to-side ES. Site B as side-to-side ES. Orientations are to be thought of as from the PES to the ES.

C9.3.1.3.2.2. See Figure C9.F1. (c). Site A as a side-to-front ES. Site B as a front-to-side ES.

C9.3.1.3.2.3. See Figure C9.F1. (d). Site each magazine as entry a front-to-front ES. Site C as a barricaded ES. Site A and B as unbarricaded ESs.

C9.3.1.3.2.4. Two additional ECM orientations warrant analysis, namely:

C9.3.1.3.2.4.1. See Figure C9.F1. (e). Site A as a side-to-front ES. Site B as a front-to-side ES.

C9.3.1.3.2.4.2. See Figure C9.F1. (f). Site A as a side-to-front ES. Site B as a front-to-side ES.

C9.3.1.3.3. **Barricaded Intermagazine Distance from ECM.** Paragraph C9.3.1.3.5 provides criteria for the application of barricaded intermagazine distance from ECM.

C9.3.1.3.4. Other factors limiting an ECM storage area are:

C9.3.1.3.4.1. Quantities above 500,000 lbs. NEW of Hazard Division 1.1 are not authorized in any one storage location, except for liquid propellants.

C9.3.1.3.4.2. The distances given in Table C9.T5, Part B, for 100 lbs. NEW of Hazard Division 1.1 constitute the minimum required magazine spacing.

C9.3.1.3.5. **Application of Barricaded Intraline Distance and Barricaded Intermagazine Distance from an ECM.** C9.F1. (g) illustrates the intermagazine relationships that can exist between an ECM and an aboveground magazine and the intraline relationships that can exist between an ECM and a facility permitted to be at intraline distance or barricaded intraline distance from an ECM, when each contain HD 1.1 ammunition and explosives. Permissible intraline distance and barricaded intraline distance exposures are provided in paragraphs C2.4.1 and C2.4.2. Siting criteria for aboveground magazines are provided in Table C9.T5, Part A. The following criteria will apply to use of barricaded intermagazine distance for aboveground magazine and for use of barricaded intraline distance from an ECM:

C9.3.1.3.5.1. **Front (120 °) Sector of an ECM.** Application of barricaded intraline distance or barricaded intermagazine distance, as applicable, from an ECM to an ES located within the ECM's 120 ° front sector requires that an intervening barricade meeting construction criteria of C5.3 be located between the ECM and the ES. If the intervening barricade does not meet these construction criteria, then unbarricaded intermagazine distance or intraline distance, as applicable, must be used for siting purposes.

C9.3.1.3.5.2. **Side and Rear (90 °) Sectors of an ECM.** If an ECM's earth cover meets construction criteria of C5.3, it qualifies as a barricade, and use of barricaded intraline distance or barricaded intermagazine distance, as applicable, from the sides or rear of the ECM is permissible. Failure of the ECM's earth cover to meet these criteria will require use of unbarricaded intraline distance or unbarricaded intermagazine distance, as applicable, for siting purposes.

C9.3.1.3.6. Standards given in subparagraphs C9.3.1.3.1 through C9.3.1.3.5, above, apply only to the storage of Hazard Division 1.1 ammunition and explosives. Existing ECM, regardless of orientation, meeting the construction and barricading requirements of Chapter 5 (and sited one from another for a minimum of 100 pounds NEW of Hazard Division 1.1), may be used to their physical capacity for the storage of Hazard Divisions 1.2, 1.3, and 1.4 provided distances to other exposures comply with applicable Q-D tables.

CHANGE 2: (Replacement of C9.F1.(g)): Replace existing C9.F1. (g) with attached C9.F1. (g).

CHANGE 3: (Replacement of C9.T4): Replace existing Table C9.T4 with the attached, revised Table C9.T4. The formulas provided in the notes replace the chart that was previously provided as part of C9.3.1.3, Intraline Distance from *ECM*.

Table C9.T4. HD 1.1 ILD FROM ECM

NEW	Barricaded			Unbarricaded		
	Front ¹	Side ²	Rear ³	Front ⁴	Side ⁵	Rear ⁶
(lbs)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)
50	37	26	22	66	59	44
70	41	29	25	74	66	49
100	46	32	28	84	74	56
150	53	37	32	96	85	64
200	58	41	35	105	94	70
300	67	47	40	120	107	80
500	79	56	48	143	127	95
700	89	62	53	160	142	107
1,000	100	70	60	180	160	120
1,500	114	80	69	206	183	137
2,000	126	88	76	227	202	151
3,000	144	101	87	260	231	173
5,000	171	120	103	308	274	205
7,000	191	134	115	344	306	230
10,000	215	151	129	388	345	259
15,000	247	173	148	444	395	296
20,000	271	190	163	489	434	326
30,000	311	218	186	559	497	373
50,000	368	258	221	663	589	442
70,000	412	288	247	742	659	495
100,000	464	325	278	835	743	557
150,000	531	372	319	956	850	653
200,000	585	409	351	1,053	936	746
300,000	669	469	402	1,205	1,071	937
500,000	716	714	714	1,429	1,429	1,429

NOTES (NEW in lbs., d in ft):

- $NEW \leq 300,000 \text{ lbs.}$ $d = 10 * NEW^{1/3}$
 $300,000 \text{ lbs.} < NEW < 500,000 \text{ lbs.}$ $d = (13.659 - 1.6479e-05 * NEW + 1.4358e-11 * NEW^2) * NEW^{1/3}$
 $d \leq 669 \text{ ft}$ $NEW = d^3 / 1000$
 $669 \text{ ft} < d < 794 \text{ ft}$ $NEW = 1.4915e+08 - 6.7025e+05 * d + 998.47 * d^2 - 0.42909 * d^3$

2. $NEW \leq 300,000$ lbs. $d = 7*NEW^{1/3}$
 $300,000$ lbs. < $NEW \leq 400,000$ lbs. $d = (1.0848 + 1.986e-05*NEW)*NEW^{1/3}$
 $NEW > 400,000$ lbs. $d = 9*NEW^{1/3}$
 $d \leq 469$ ft $NEW = d^3/343$
 469 ft < $d < 663$ ft $NEW = 57,424 + 515.89*d$
 $d > 663$ ft $NEW = d^3/729$

3. $NEW \leq 300,000$ lbs. $d = 6*NEW^{1/3}$
 $300,000$ lbs. < $NEW < 400,000$ lbs. $d = (-3.059 + 3.0228e-05*NEW)*NEW^{1/3}$
 $NEW > 400,000$ lbs. $d = 9*NEW^{1/3}$
 $d \leq 402$ ft $NEW = d^3/216$
 402 ft < $d < 665$ ft $NEW = 148,160 + 379.7*d$
 $d > 665$ ft $NEW = d^3/729$

4. $NEW < 500,000$ lbs. $d = 18*NEW^{1/3}$
 $d \leq 1429$ ft $NEW = d^3/5,832$

5. $NEW \leq 300,000$ lbs. $d = 16*NEW^{1/3}$
 $300,000$ lbs. < $NEW \leq 400,000$ lbs. $d = (9.9683 + 2.0135e-05*NEW)*NEW^{1/3}$
 $NEW > 400,000$ lbs. $d = 18*NEW^{1/3}$
 $d \leq 1071$ ft $NEW = d^3/4,096$
 1071 ft < $d < 1328$ ft $NEW = -118,180 + 390.35*d$
 $d > 1328$ ft $NEW = d^3/5,832$

6. $NEW \leq 100,000$ lbs. $d = 12*NEW^{1/3}$
 $100,000$ lbs. < $NEW \leq 300,000$ lbs. $d = (11.521 + 1.9918e-06*NEW + 2.0947e-11*NEW^2)*NEW^{1/3}$
 $300,000$ lbs. < $NEW \leq 400,000$ lbs. $d = (1.9389 + 4.0227e-05*NEW)*NEW^{1/3}$
 $NEW > 400,000$ lbs. $d = 18*NEW^{1/3}$
 $d \leq 557$ ft $NEW = d^3/1,728$
 557 ft < $d < 938$ ft $NEW = -193,080 + 526.83*d$
 938 ft < $d < 1328$ ft $NEW = 60,778 + 255.83*d$
 $d > 1328$ ft $NEW = d^3/5,832$

TITLE: Minor Clarification of General Comment "e" in C9.T2.

APPROVED CHANGE:

e. Sandbag shield is required only during handling of torpedoes from motor vehicles. Sandbag shield requirement is equivalent to a minimum thickness of 2-feet of sand between the motor vehicle cab and the torpedoe(s). The sandbags must shield all parts of the motor vehicle cab from the torpedo warhead. The barricade is not required during handling from boats, torpedo transporters, forklifts, or portable cranes.

TITLE: Correction of Errors in Table 10-3.

APPROVED CHANGE:

Revised Table 10-3 for the two PES/ES relationships shown below:

	From:	1st			READY	
	PES	Generation HAS			SERVICE AGM	
To: ES		S	R	F	B	U
2nd &	S					
3rd	R			K2.75/1.1Q^{1/3}		
Gen	F				K2.75/1.1Q^{1/3}	

TITLE: Correction of intermagazine Separation Distance Error in Table C9.T5.

APPROVED CHANGE:

K6 separation distance versus K9 separation distance specified from the F(B) of an ECM to the FU of a 3-Bar ECM (see below).

To EXPOSED SITE (ES)		From POTENTIAL EXPLOSION SITE (PES)								
		ECM				AG		Modules	HP	
						Magazine ³		and/or	Magazine ⁸	
								Cells ⁷		
		S	R	F(B)	F(U)	B	U	B OR U	S,R	F ⁹
ECM ² (7-Bar)	S	1.25	1.25	2.75	2.75	4.5	4.5	4.5	1.25	2.75
	R	1.25	1.25	2	2	4.5	4.5	4.5	1.25	2
	FU	2.75	2	6	6	6	6	6	2.75	6
	FB ⁴	2.75	2	4.5	6	4.5	6	6	2.75	6
ECM ² (3-Bar)	S	1.25	1.25	2.75	2.75	6	6	6	1.25	2.75
	R	1.25	1.25	2	2	6	6	6	1.25	2
	FU	4.5	4.5	6	9	6	9	9	4.5	9
	FB ⁴	4.5	4.5	6	6	6	6	6	4.5	6
ECM ² (Undefined)	S	1.25 ⁵	1.25 ⁵	4.5 ⁵	4.5 ⁵	6	6	6	1.25	4.5
		2 ⁶	2 ⁶	6 ⁶	6 ⁶					
	R	1.25	1.25	2	2	6	6	6	1.25	2
	FU	6	6	6	11	6	11	11	6	11
	FB ⁴	6	6	6	6	6	6	6	6	6
AG Magazine ³	U	6	6	6	11	6	11	11	6	11
	B	6	6	6	6	6	6	6	6	6
Modules and/or	U	6	6	6	11	6	11	11	6	11
Cells ⁷	B	1.25	1.25	6	6	6	6	1.1	1.25	6
HP Magazine ⁸	S,R,F ¹⁰	1.25	1.25	2.75	2.75	4.5	4.5	4.5	1.25	2.75

TITLE: NAVY proposed changes to DDESB criteria for separation of non-explosives ships from explosives ships at anchorages.

APPROVED CHANGES:

CHANGE 1 (new paragraph C9.5.4.6.)

C9.5.4.6. **Separation of Preposition Program Ships at Anchorages.** The Military Sealift Command's Prepositioning Program (i.e. Combat Prepositioning Force, Maritime Prepositioning Force, Logistics Prepositioning Ships, etc.) operates both explosives-loaded and non-explosives carrying ships that are then deployed to key locations around the world. These ships are pre-loaded with military equipment and supplies necessary to support military forces on a short-notice basis and thus support a common mission. The following criteria applies to Prepositioning Program ships at anchorage:

C9.5.4.6.1. Non-explosives carrying ships shall be separated from explosives-loaded ships by a minimum of $18W^{1/3}$.

C9.5.4.6.2. Non-explosives carrying ships shall be separated from non-Prepositioning Program explosives-loaded ships by $40W^{1/3}$.

C9.5.4.6.3. Non-explosives carrying ships not associated with the Prepositioning Program shall be separated from all explosives carrying ships by $40W^{1/3}$.

C9.5.4.6.4. All non-explosives carrying ships shall be separated from explosives ships being loaded or unloaded by $40W^{1/3}$.

CHANGE 2 (Figure C9.F2 Legend, added new Item 3A):

3A $18W^{1/3}$ (see C9.5.4.6 for Prepositioning Program ships)

CHANGE 3:

In C9.F2, for the relationship between an explosives anchorage and a non-explosives anchorage, 3/3A now specified.

TITLE: Approved Munitions For ARMCO Revetments

APPROVED CHANGE:

C5.3.6.2. Armco Inc. revetments cells are approved for storage of any HD 1.1 and HD 1.2 AE assigned to Sensitivity Groups 1 through 4, as discussed in C5.2.4.1. In addition, storage of HD 1.3, HD 1.4, or HD 1.6 items is approved.

TITLE: Minor Change to Table C5.T2, Maximum Case Fragment Ranges for Selected Single Item Detonations.

APPROVED CHANGE:

Revised maximum fragment distance for 37 mm from 1180 feet to 980 feet, as shown on the below revised C5.T2.

Munition	MAXIMUM FRAGMENT THROW RANGE (CASE FRAGMENTS) (feet)
20 mm projectile	320
25 mm projectile	760
37 mm projectile	980
40 mm projectile	1100
40 mm grenade	345
M229, 2.75" rocket	1375
M48, 75-mm projectile	1700
M1, 105-mm projectile	1940
MK 35, 5"/38 projectile	2205
MK 64, 5"/54 projectile	1800
M107, 155-mm projectile	2580
M437, 175-mm projectile	2705
M106, 8-in projectile	3290
MK 13 & MK 14 16"/50 projectil	5640
M49A3, 60-mm mortar	1080
M374, 81-mm mortar	1235
M3A1, 4.2-in mortar	1620
M64A1 , 500-lb bomb	2500
MK 81, 250-lb bomb	2855
MK 82, 500-lb bomb	3180
MK 83, 1000-lb bomb	3290
MK 84, 2000-lb bomb	3880
BLU-109 bomb	4890